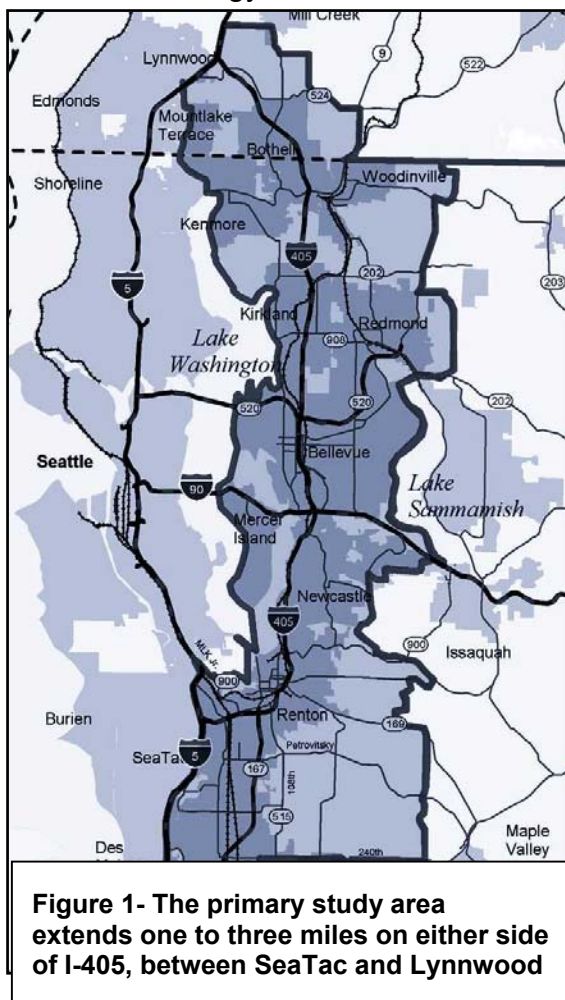


Title:**Demonstrating Remote Sensing Solutions for Environmental Analysis of the Washington State I-405 Corridor****Context:**

One of the most expensive and time-consuming aspects of early transportation project planning is the selection and environmental assessment of potential routes or corridors. Alternative routes and designs are evaluated not only on how well transportation objectives are met, but also on the degree to which significant negative environmental and socioeconomic impacts are minimized. The environmental review processes mandated under National Environmental Policy Act generally require extensive data collection on potentially affected environmental resources for alternatives, including the proposed action. This process can require several years of study and field work to develop an adequate baseline of information on existing environmental conditions for such resources as air and water quality, geology, soils, hydrology, water use, aquatic and terrestrial ecology, socioeconomic resources, cultural resources, and aesthetics.



In order to be credible, National Environmental Policy Act analyses should be based on good quality data and a clear demonstration that appropriate alternatives have been considered and evaluated in an objective fashion. Remote sensing data can contribute to improving the National Environmental Policy Act review process by providing a credible baseline of information for evaluating alternatives early in the process and eliminating unnecessary and costly detailed analysis.

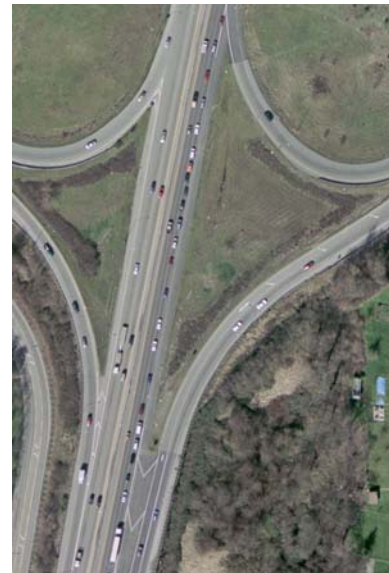
Transportation system improvements are desperately needed in Washington State's Puget Sound metropolitan area. The highly urbanized Interstate 405 corridor is one of several programmatic environmental analyses for transportation improvements either in-process or planned for the metropolitan area. The regional transportation planning process has identified the I-405 corridor as being a high priority for

congestion relief. Unfortunately, transportation planning and the National

Environmental Policy Act (NEPA) process for major projects have become long and costly -- not only in the State of Washington but nationwide -- and have delayed the delivery of transportation improvements to the point where considerable time and money have been lost. By comparing the cost and quality of results obtained from traditional data collection methods used to meet National Environmental Policy Act requirements with those using the methods which this project will develop, this project aims to demonstrate an approach that uses remote sensing technologies to streamline environmental analysis in the transportation planning process.

Technical Description:

The project consists of six major tasks: 1) Undertake field study in two stages, first to collect ground-truth data prior to image analysis, and then to evaluate the image-analysis results against the "real-world." 2) Compile and evaluate available image data and fuse these data to create the best possible resource for image data analysis. 3) Characterize land use and land cover (LULC) in the region. 4) Integrate the land use and land cover characterization from the previous task, with GIS and other data, to provide land use/land cover and transportation images, and related analysis. 5) Develop estimates and compare the cost and quality of information developed with conventional methods with those developed in this project. 6) Document the procedures, analysis, and findings to institute technology transfer steps.



The strategy of this project is not to lock into a specific technology, but to adopt an approach that makes combined use of different technologies in order to achieve synergistic advantages. Methods are being developed to fuse a variety of available data such as black-and-white and color orthophotos, IKONOS images, and Landsat-7's Enhanced Thematic Mapper Plus (ETM+) images to take advantage of their different attributes to achieve synergistic results. The black-and-white and color orthophotos have a half foot spatial resolution will be utilized to achieve high geometric accuracy for ground feature identification and delineation. Landsat ETM+, on the other hand, will be utilized to cover large geographic areas, and provide multi-spectral information that is particularly useful for discriminating among different LULC types. Image data available for this project include Landsat 7 and IKONOS multi-spectral scenes, black and white orthophotos produced by the Washington State Department of Natural Resources, and high resolution color orthophotos produced by the Washington State Department of Transportation.

The multi-spectral imagery provided by Landsat-7 have the spectral signatures of many different features, which can be exploited to obtain information on land use and land cover classes – information that is important for environmental analysis and the transportation planning process. Using IKONOS imagery, road pavement, edge lines, and central stripes can be accurately mapped. Bridges, parking lots, and even vehicles on or along the roads can be identified. Environmental conditions and transportation impacts such as urban growth, increased area covered by impervious surfaces, or habitat fragmentation can be now evaluated at much improved accuracy.

Available GIS data layers such as transportation networks, demographic data, and topographic map data along I-405 have also been collected. Imagery and vector data are being integrated to form a source database for analysis. To handle data integration, the project will use two major commercial software products: the IMAGINE image processing system and ARC/INFO GIS. IMAGINE, which was developed by one of the study partners, ERDAS, Inc., is a full suite of products for image mapping and visualization, image processing and advanced remote sensing. ARC/INFO is one of the leading GIS products capable of performing many data integration functions such as projection transformation, rubber sheeting for local coordinate adjustment, and data display for visual editing and correction.

Products to be generated include: 1) A spatial database of raw image data from a variety of remote sensing sources, and derived and interpreted information in GIS format including land use and land cover information. 2) Software procedures accessing multiple data sources to derive land use land cover information and to identify and delineate areas where proposed transportation development are likely to cause environmental impacts. 3) Cost-benefit analysis of study methods and a comparison to costs of conventional practices, including qualitative comparison of content, accuracy and timeliness. 4) Guidelines for use of these methods and techniques by other DOTs.

Credits & Contacts:

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Erdas, Inc.
Puget Sound Regional Council
U.S. Environmental Protection Agency
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